

# Factors Associated with Depression among Older People in Vietnam

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## Abstract

*Depression is one of the leading causes of disease burdens in recent years, and it is expected to continue to be so in the coming decades. Depression among older people (defined as those 60 years and older) is associated with disability, increased mortality, and poorer outcomes from physical illness, but it is often under-recognized and under-treated since people know little about the underlying factors influencing it in the elderly, and how they are correlated. This paper aimed to investigate the various factors associated with depressive symptoms among Vietnam's elderly population. We used the first-ever nationally representative data for older people, namely, the Vietnam Aging Survey (VNAS) in 2011, along with probit regression models to identify these factors. We found that, for both urban and rural areas, older people who experienced domestic violence, who did not have enough finance for daily living, and who lived alone were more likely to be depressed than their counterparts. In contrast, marital status, educational level, working status, mutual support between older people and their children, and participation in social activities were not factors significantly related to their depression. Due to different living conditions and arrangements, the depression contexts of urban and rural older people were significantly determined by different factors, such as the roles in family decision-making and the burden of care of great-grandchildren or other family members.*

## Keywords

*Aging; depression; healthcare; older people; policy; Vietnam*

## Introduction

The world is experiencing rapid changes in population structure, resulting in an unprecedented increase in its aged population. Population aging, measured by an increasing share of older people in the total population, is considered one of the most critical social changes and significant demographic trends of the twenty-first century (UNFPA & HAI, 2012; UNESCAP, 2017). The world's elderly population was 962 million in 2017 and is projected to be 2.3 billion in 2050, and developing countries, which are experiencing a faster increase in aged populations than developed countries, are home to two-thirds of the world's elderly population (UN-DESA, 2017). Population aging poses important implications for many sectors of society, and the health care of older people has been a major concern in both developed and developing countries. It has been well documented that the aging process is significantly associated with the deterioration of individual's health as well as higher risks of

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disability and mortality (WHO, 2015). Vietnam is not an exception to these demographic and health trends, and the population projections by the General Statistics Office of Vietnam (GSO, 2016) indicate that in three decades it will be one of the top ten countries with the highest growth rates of elderly people, with older people accounting for 25% of the total population (or about 27 million persons) by 2050. Non-communicable diseases are prevalent among older people and even among younger generations, and are expected to cause an increase in healthcare costs in the coming decades (Pham & Do, 2009; Giang, Pham & Pham, 2016; Ministry of Health, Vietnam & Health Partnership Group (MOH & HPG), 2018).

For older people, depression has been increasingly considered to be one of the most concerning mental health problems. Depression reflects a range of biological and social factors and it may be difficult to diagnose in older people because they usually under-report depressive symptoms and may not confess to being dissatisfied or depressed. This can be due to age, shame and lack of understanding of the disorder or a belief that one should not talk about depression or admit to not coping (Eyers, Parker & Brodaty, 2012). Lopez and Murray (1998) indicate that, for the general population, depression ranked fourth in the ten leading causes of the worldwide disease burden in the early 1990s, but it was estimated to reach second place by the year 2020. Notably, 1–4% of the general elderly population has major depression, equivalent to an incidence of 0.15% per year (Blazer, 2003), and twice as many women as men are affected (Alexopoulos, 2005). Both the prevalence and the incidence of major depression double after the age of 70–85 years (Teresi, Abrams, Holmes, Ramirez, & Eimicke, 2001). Studies on Cuba, South Africa, Spain, and Brazil (see, for instance, Sicotte, Beatriz, Esther-Maria, & Maria-Victoria, 2008; Bojorquez-Chapela, Villalobos-Daniel, Manrique-Espinoza, Tellez-Rojo & Salinas-Rodríguez, 2009; Barcelos-Ferreira et al., 2009; Peltzer & Phaswana, 2013) are consistent in reporting that depressive symptoms and mental disorders affect not only the health of older people, but also exacerbate issues with well-being involving finance, social relationships, and family life.

Vietnam, as a low middle-income country with an expected rapidly aging population, faces similar issues related to depression (MOH & HPG, 2018) but depression has not received enough concern in comparison with other social issues. There is a variety of literature on older people's physical health, poverty, income insecurity and living arrangements, but studies on older people's depression and its causes and consequences are much rarer. Though there have been some studies, they have used data from small-scale or unrepresentative—rather than nationally representative—samples of older people, so that the findings do not reflect the various underlying causes of depression. Only the Vietnamese Women's Union (2012) has so far used a national survey on older people, namely the Vietnamese Aging Survey (VNAS), to show that about 32% of Vietnamese older people could not share their experience of depression with anyone. It just provided, however, simple statistics without any in-depth analysis on associated factors. As such, our study was apparently the first one using the national survey on Vietnamese older people to provide empirical results about their depression. It examined the current situation and possible factors associated with older people's depression. More specifically, the key questions of this paper examined the prevalence of depression among the Vietnamese elderly and the factors associated with such depression.

## Literature Review

In this section, we will provide an analysis on previous studies on and factors determining older people's depression in various countries with different socio-economic settings as well as in Vietnam.

In a study investigating depression and its associated factors on older adults in South Africa, Peltzer and Phaswana-Mafuya (2013) used the Study of Global Ageing and Adult Health (SAGE). They used the data collected from 3,480 individuals aged 50 and over in South Africa in 2008. The authors focused on questions of social-demographic characteristics, health status, diseases and chronic conditions, cognitive impairment, functional disability and quality of life and used a multivariable regression analysis to identify the impacts and associations of the mentioned variables on the depression of older adults. They found that low functional disability and low quality of life were key factors determining depression. However, neither of the socio-demographic variables, lifestyle factors, social cohesion nor chronic conditions had impacts on depression.

In the case of Spain, Zunzunegui, Béland and Otero (2001) used information from "Aging in Leganes", a longitudinal study of community-dwelling elderly conducted by face-to-face home interviews of 1,284 people aged 65 and over. The main independent variables were living arrangements and emotional and instrumental support provided by children, while independent variables included age, gender, and educational levels. The authors found that the key factors of older people's depression were closely associated with low levels of support and help received from children. Being a widower living alone was more likely to result in poor self-rated health and thus depression. For widowers who did not cohabit with children, however, receipt of instrumental aid was associated with low depressive symptoms. In addition, the association between support from children and older people's depression was significantly influenced by age, gender, education, and functional status of older people.

Sicotte et al. (2008) examined the main and the stress-buffering effects of social networks on depressive symptoms among Cuban older people who lived in La Havana. With 1,905 older people aged 60 and over from the database of the SABE (Salud Bienestary Enuejecimiento) study, the research used gender-specific multivariate logistic regressions to test the main independent variables of stressors and stress-buffering effects (financial strain or disabilities) on depressive symptoms. The authors used marital status, living arrangements of older people and their children, reciprocity of help from children and reciprocity of help from relatives as independent variables. The results indicated that women who were married, lived in extended families, and had balanced exchanges with relatives and children suffered lower levels of depressive symptoms than their counterparts. Moreover, men who were married and not living alone reported a low prevalence of depressive symptoms.

Exploring depression in older people living in Sao Paulo, Brazil, Barcelos-Ferreira et al. (2009) examined clinically significant depressive symptoms to assess the relationship between their clinical diseases and social demographic factors. Using univariate and logistic regression analyses, the authors found that females; those who previously had depression; those who did not practice physical exercises were more likely to suffer from depressive symptoms. In contrast, those who were at more advanced ages; who were clinically ill; who were still working; and who were married did not show clinical symptoms of depression.

Borges, Benedetti, Xavier and d'Orsi (2013) estimated the prevalence and associated factors of depressive symptoms for 1,656 older persons in Florianópolis (Brazil) under the EpiFloripa Elderly Survey. In this study, the prevalence of depressive symptoms was obtained using the

Geriatric Depression Scale (GDS-15). The authors explored the possible socio-demographic, health, behavioral and social factors associated with such depression. They found that about 24% of the elderly had depressive symptoms. Factors negatively influencing depression in the elderly included no schooling status, worse financial conditions, cognitive impairment, weak perceived health status, functional dependence, and chronic pain. Factors with protective effects included younger age groups, physical activity in leisure time, participation in social or religious groups, and having sexual relations.

Using the data collected in 2006 from a survey on life conditions and wellness of 1,497 Mexican people aged 70 and over, Bojorquez-Chapela et al. (2009) tried to figure out the differences between men and women in response to depressive disorders. Various factors were considered, including socio-economic status indicators (such as literacy, poverty, working status, and residential areas), social relationships (such as living arrangements, marital status, and position of older people in the family). Multivariate logistic regression models for male and female older people were performed to identify the association among the mentioned factors with depression in elderly men and women. The authors found that women generally could react to depressive status more easily than did men. In particular, for males, a lower frequency of activity of daily living (ADL) problems and higher levels of literacy were strongly associated with less depressive symptoms, while for females, ADL problems and being a household head resulted in more depressive symptoms.

Using cross-sectional data from the Center for Research and Population Health of the American University of Beirut involving 3,300 households from three poor communities in metropolitan Beirut, Bassem, El-Roueiheb, Chaaya and Sibai (2005) examined factors associated with depression in female elderly people. Using a bivariate data analysis with selected demographic, socio-economic and health variables, this study found that the prevalence rate of depression among elderly women was 29.6%, which was higher than that for elderly women in other neighboring countries. They also found that nationality and stigmatization were the two most important variables to be significantly correlated with depression. In addition, this study also indicated that historical dispossession, lack of current opportunities, and extremely harsh living conditions were significant determinants. Disability and low household income were important factors in exacerbating depression. Elderly women who engaged in physical activities were less likely to be depressed than those who did not. The authors also found that marital status and age were not significantly linked to depression. The role of the extended family and strong family bonds was significant in reducing older people's depression.

Maulik and Dasgupta (2012) analyzed depression and its determinants in rural older people in West Bengal. They used data from a cross-sectional community study with 82 older people (aged 60 and over), and found that being a female, illiterate, poor, absent of personal income, lacking a spouse, not being consulted for decisions, and feelings of illness were significant risk factors for depression. In contrast, being of a more advanced age, being separated/divorced/widowed, and staying at home were not significant factors in the depression of the older people studied.

Suttajit et al. (2010) explored the possible impacts of impairment, disability, and social support on depression among older people in Thailand. They used a Thai version of the EURO-D scale to measure depression with a sample of 1,104 Thai rural elderly. Using logistic regression modelling, they found that the level of impairment along with poor social support were more likely to result in depression. More importantly, social support helped reduce the association between physical impairment and depression for Thai older people, particularly for those with a large number of impairments. The authors suggested that social support, improved healthcare, and disability facilities should be key for preventing elderly depression. Similar

results were found in research by Jittawisuthikul, Jirapramukpitak, and Sumpowthong (2011) with data collected from 358 Thai older people with different levels of disability living in rural and urban communities. The authors concluded that disability was one of the main contributors to elderly depression, and as such, improving community and public facilities as well as access to health services for disabled older people would help to enhance their quality of life and prevent depression.

Regarding Vietnam, there have been several studies on depression in older people, all of them using different small-scaled and unrepresentative survey data. Leggett, Zarit, Nguyen, Hoang, and Nguyen (2012), used a sample of 600 persons aged 55 and older living in rural areas in Da Nang City, of which 50% were women and 50% were men. Depression was measured by a Vietnamese version of the CES-D and a culturally-specific worry scale. The authors found that 47% of the sample had scores above the cut-off for clinical depression and scores on the worry scale were high. The results from multiple linear regressions indicated that women, the less educated, and those with more material hardship had higher depressive symptoms, while rural residents, women, the married, and individuals at younger ages were more worried. For both depressive symptoms and worry, pain, ADL problems and emotional support were significantly associated factors. Only depressive symptoms were associated with illnesses. Also, in Da Nang City, Le, Jullamate, and Rosenberg (2017) collected data from older patients to examine the relationships between the level of post-stroke depression and various factors (such as age, gender, education, ADL problems, social support, and self-esteem). The results showed that ADL problems, social support, and self-esteem were significantly and negatively correlated with post-stroke depression, while age, gender, and educational level were not significantly related to post-stroke depression.

With the data collected from 412 older patients with type 2 diabetes mellitus (T2DM) at a national hospital, Vu et al. (2018) explored the factors associated with their depressive symptoms, which were assessed using the Geriatric Depression Scale, which has three categories (i.e., normal: 0–4 points; mild: 5–9 points; and moderate/severe:  $\geq 10$  points). The results showed that 79.4% of the studied patients had depressive symptoms. Depressive symptoms were associated with risks of falls, suffering from 5–10 years of diabetes, uncontrolled fasting plasma glucose, and an impairment of IADLs.

To explore depression and its associated factors among the urban elderly, Dao, Nguyen, Nguyen, and Nguyen (2018) conducted a survey with 299 persons in Ha Noi City. Depression was self-reported with three levels: mild, moderate, and severe. The results showed that 66.9% of the older sample had depression, of which 32.8%, 30.4%, and 3.7% were mild, moderate, and severe cases, respectively. A multivariate analysis indicated that age and medicine intake quantity were positively correlated with depression, while the number of physical activities undertaken and three domains of quality of life (i.e., physical health, psychological health, and environmental health) were negatively correlated with depression.

Although the above studies explore factors associated with depression in older people in Vietnam, they might not be generalizable since they employed unrepresentative data. As such, our current study added to the literature on this issue using data from a nationally representative survey on the Vietnamese older people.

## Data Source

In this study, we used the Vietnam Aging Survey (VNAS), which was the first nationally representative survey on older adults (aged 50 years and over) in Vietnam (Vietnam Women

Union-VWU, 2012). The VNAS, which was conducted in late 2011, contains rich information on the socio-demographic, living, and health characteristics of older people and their households. The VNAS sample was chosen using data from the Population and Housing Census in 2009 with a multi-stage sampling method. Data were collected by face-to-face interviews using structured questionnaires, and the response rate was 96.3%. At the end of the survey, the VNAS included 4,007 people aged 50 and over who were selected from 400 villages within 200 communes in 12 provinces of 6 ecological regions in Vietnam. Among the final VNAS sample, there were 2,798 older persons (aged 60 and over).

In regard to older people's depression, the VNAS asked older people a question "How often do you feel sad or depressed in later life?", and there were three possible answers, including "Not at all", "Sometimes", and "Most of time".

## Data Analysis

We used probit regressions to examine the possible factors associated with older people's depression. Before applying the regression, we conducted Chow tests to determine whether elderly males and females, and urban and rural older people were statistically different in terms of depression. Then, we defined the final regression model(s) to analyze factors determining older people's depression. A probit regression model to examine the factors associated with older people's depression could be expressed as follows:

$$P(D_i=1) = X_i\beta_i + \varepsilon_i, \varepsilon_i \sim N(0, \sigma^2)$$

Where:

- $P$  is the probability function;
- $i$  is the older person  $i$ ;
- $D$  shows the binary value of the depression status, in which  $D=1$  means older people felt depressed (for the answers "Sometimes" and "Most of time"), and  $D=0$  means older people did not feel depressed (for the answer "Not at all").
- $X$  shows different sets of independent variables representing individual and household characteristics;
- $\beta$  is coefficient; and
- $\varepsilon$  shows the measurement error term and is assumed to follow a normal distribution.

In addition, each variable included different subgroups, and we selected one subgroup as the reference group, while the others were comparative group(s). For instance, the variable "working status" was categorized into two subgroups, i.e., "currently working" and "currently not working", in which the subgroup "currently not working" was chosen as the reference group, and thus "currently working" was the comparative subgroup. In the estimates, statistically significant and negative coefficients mean that the comparative groups were less likely to affect depression in the elderly than were the reference groups, and vice versa.

## Study Variables

### Dependent variables

For the probit regression models, the variable “Depression” was a binary variable: it was coded 1 (showing older people with depression) for those who chose “Sometimes” and “Most of the time”, while it was coded 0 (showing older people without depression) for those who chose “Not at all”.

Out of the 2,789 older people in the sample, 312 older people responded “Unknown”, and 8 “Undefined” for the question on depression, so we had a remaining pool of 2,469 older people for the estimations. Of those people, about 39.62% said that they did feel depressed.

### Independent variables

We categorized these variables into three main groups: i) Individual characteristics include age; sex; marital status; education level; working status; had difficulties with activities of daily living (ADLs); had functional limitations; ii) Household-related characteristics include area of living; living arrangements; financial status; ever experienced domestic violence; had a role in family decisions; received help from child(ren) for housework; received monetary support from child(ren); provided monetary support to child(ren); and took care of (great) grandchild(ren) or other family members; and iii) Community-related characteristics include participated in social organizations and community activities; and had respect from community as an older person.

Table 1 summarizes measurements and classifications for these variables in the probit model(s).

**Table 1:** Measurements and classifications of independent variables

Variable	Measurements and classifications in the model(s)
<i>Individual characteristics</i>	
Age	This was assessed chronologically and as a continuous variable. In the sample, the age of the respondents ranged from 60 years to 108 years. For data description, three age categories were used, including young old (60-69); middle old (70-79); and the oldest old (80 and over)
Sex	Dichotomous: 0=women and 1=men. For the probit model (s), females were the reference group
Marital status	Dichotomous: 0=currently not married (never married; widowed; divorced; and separated) and 1=currently married. For the probit model(s), currently not married was the reference group
Educational level	Dichotomous: 0=no schooling (including never schooling and incomplete primary school) and 1=primary school and above. For the probit model(s), former group was the reference group
Working status	Dichotomous: 0=currently not working and 1=currently working. For the probit model(s), the former group was the reference group
Had difficulties with activities of daily living (ADLs)?	VNAS provided information about older people’s difficulties with activities of daily living (ADLs), including eating, getting dressed or undressed, bathing, getting up, and using the toilet. In the model, this variable was dichotomous: 0=no difficulty and 1=at least one difficulty. The former group was the reference group
Had functional limitations?	VNAS provided information on some activities (such as walking 200-300 meters; using fingers to grasp or hold things). In the model, this variable was dichotomous: 0=no limitation and 1=at least one limitation. The former group was the reference group

Variable	Measurements and classifications in the model(s)
<b><i>Household-related characteristics</i></b>	
Living arrangements	Dichotomous: 0=not living alone (such as living with spouse only or living with at least a child) and 1=living alone. For the probit model(s), former group was the reference group
Financial status	VNAS included a question for older people who provided a self-assessment of their financial status, i.e. "Had enough finance for daily living?" In the model, this variable was dichotomous: 0=no and 1=yes. The former group was the reference group
Ever experienced domestic violence	Dichotomous: 0=never experienced and 1=ever experienced. For the probit model(s), former group was the reference group
Had a role in family decisions	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
Received help from children for housework	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
Received monetary support from children	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
Provided monetary support to children	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
Took care of (great)grandchild(ren) or other family members	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
<b><i>Community-related characteristics</i></b>	
Participated in social organizations and community activities	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group
Had respect from community as an older person?	Dichotomous: 0=no and 1=yes. For the probit model(s), former group was the reference group

## Findings and Discussion

In this section, we first provide an overview of the incidence of depression among older people in Vietnam. Then, we provide the results from Chow tests to define the final probit regression model(s). The results of the regression are presented here along with possible underlying causes.

### Depression prevalence among the Vietnamese older people

Table 2 shows the prevalence of depression in older people by various socio-demographic and household characteristics. In general, 39.62% of older people in the sample study experienced depression. Regarding age, people of a more advanced age were found to have higher rates of depression than those of a younger age. Regarding sex, 31.66% of males experienced depression, while the figure for females was 45.67%, meaning that elderly women suffered from depressive symptoms more than their male counterparts. In terms of marital status, only one-third of married older people were depressed, while more than half of non-married older people were. Similarly, older people who were working had lower rates of depression than those who were not working (36.44% vs. 41.85%). There were large differences between those having at least one ADL problem and those who could do all ADLs (51.42% vs. 33.64%), and those having at least one limitation in function and those who could do all functional activities (46.66% vs. 24.58%).

With regard to household-related characteristics, the results in Table 2 also indicate that rural people suffered a higher rate of depression than did urban people (41.16% vs. 36.54%).



With regard to living arrangements, people living alone had a significantly higher rate of depression than any other group (78.13% for elderly people living alone compared to only 33.41% for older people living with spouses only). Such a difference was also observed when comparing people having enough finance for daily living and those having insufficient finance (47.37% vs. 27.48%); people who experienced domestic violence and those who did not (64.78% vs. 36.16%); people who had a role in household decisions and those who did not (57.85% vs. 34.44%); people who received children's help in household work and those who did not (37.85% vs. 43.15%); people who received monetary support from children and who did not (38.12% vs. 43.42%); people who provided monetary support to their children and those who did not (37.13% vs. 40.07%); and people who took care of their (great)grandchildren and other family members and those who did not (36.75% vs. 42.02%).

In terms of community-related characteristics, people participating in social organizations and community activities had lower rates of depression than those who did not (34.49% vs. 43.04%), and those who felt they had the respect of the community had a much lower rate of depression than those who did not (36.60% vs. 50.58%).

**Table 2:** Weighted percentages of depression among the elderly by various characteristics

Characteristics		N	% Depression
<b>Total</b>		<b>2,469</b>	<b>39.62</b>
<i>Individual characteristics</i>			
Age groups	60-69	1,128	33.37
	70-79	747	42.83
	80 and over	594	49.88
Sex	Female	1,476	45.67
	Male	993	31.66
Marital status	Currently not married	976	54.47
	Currently married	1,493	33.54
Educational level	No schooling	402	55.45
	Primary and above	2,067	36.84
Currently working?	No	1,483	41.85
	Yes	986	36.44
Had ADLs difficulties?	No difficulty	1,596	33.64
	At least one difficulty	873	51.42
Had functional limitations?	No limitation	717	24.58
	At least one limitation	1,752	46.66
<i>Household-related characteristics</i>			
Living area	Rural	1,814	41.16
	Urban	655	36.54
Living arrangements	Alone	235	78.13
	With spouse only	471	33.41
	With at least a child	1,570	37.90
	Other	94	43.08
Had enough finance for daily living?	No	1,604	47.37
	Yes	865	27.48
Ever-experienced domestic violence	No	2,162	36.16
	Yes	307	64.78
Had a role in family decisions?	No	653	57.85
	Yes	1,816	34.44
Received help from child(ren) for household work?	No	798	43.15
	Yes	1,680	37.85
Received monetary support from child(ren)?	No	727	43.42
	Yes	1,742	38.12
Provided monetary support to child(ren)?	No	2,049	40.07
	Yes	420	37.13

Characteristics		N	% Depression
Took care of (great)grandchild(ren) or other family members?	No	1,348	42.02
	Yes	1,121	36.75
<b>Community-related characteristics</b>			
Participated in social organizations and community activities?	No	1,444	43.04
	Yes	1,025	34.49
Had respect from community as an older person?	No	526	50.58
	Yes	1,943	36.60

Source: Own calculations, using VNAS 2011

## Determinants of depression among older people

Before using probit regression models to identify the possible determinants of older people's depression, we applied Chow tests to examine differences or similarities between the elderly in rural and urban areas, as well as between male and female older people. The results of our Chow test for males and females showed that the null hypothesis (i.e., male and female older people were not different in regard to depression) was not rejected.<sup>1</sup> In contrast, our results from the Chow test for rural and urban elderly indicated that the null hypothesis (i.e., rural and urban people were not different in terms of depression) was rejected.<sup>2</sup> Therefore, we had two separate probit regression models for older people in rural and urban areas to identify possible determinants of their depression situations.

We applied 10-percent, 5-percent, and 1-percent significance levels for the estimated coefficients. As discussed, statistically significant and negative coefficients mean that the comparative groups were less likely to feel depressed than were the reference groups, and vice versa. Table 3 presents our estimates for urban and rural older people.

**Table 3:** Probit regression for depression between rural and urban areas

Characteristics	Model 1 (Urban)			Model 2 (Rural)		
	Coefficient	95% CI		Coefficient	95% CI	
Age	0.024**	0.001	0.042	-0.004	-0.002	0.015
Sex						
Female (ref.)	-	-	-	-	-	-
Male	-0.320**	-0.618	-0.023	-0.105	-0.346	0.137
Marital status						
Currently not married (ref.)	-	-	-	-	-	-
Currently married	-0.153	-0.477	0.171	-0.254*	-0.515	0.005
Education level						
No schooling (ref.)	-	-	-	-	-	-
Primary and above	-0.264	-0.672	0.144	0.191	-0.153	0.535
Currently working?						
No (ref.)	-	-	-	-	-	-
Yes	0.164	-0.136	0.464	-0.145	-0.362	0.073
Had ADL difficulties?						
No difficulty (ref.)	-	-	-	-	-	-
At least one difficulty	0.102	-0.367	0.571	0.172	-0.072	0.416
Had functional limitations?						
No limitation (ref.)	-	-	-	-	-	-
At least one limitation	0.294	-0.06	0.651	0.433***	0.174	0.690

<sup>1</sup> In the test,  $\chi^2(17) = 25.95$  and Prob. >  $\chi^2 = 0.0753$ , so that the null hypothesis is not rejected at 10 percent significance level.

<sup>2</sup> In the test,  $\chi^2(17) = 19.76$  and Prob. >  $\chi^2 = 0.2869$ , so that the null hypothesis is rejected at 10 percent significance level.

Characteristics	Model 1 (Urban)			Model 2 (Rural)		
	Coefficient	95% CI		Coefficient	95% CI	
Living arrangements						
Not living alone (ref.)	-	-	-	-	-	-
Living alone	0.273	-0.375	0.921	0.773***	0.438	1.106
Had enough finance for daily living?						
No (ref.)	-	-	-	-	-	-
Yes	-0.440***	-0.726	-0.154	-0.382***	-0.643	-0.123
Experienced domestic violence?						
No (ref.)	-	-	-	-	-	-
Yes	0.774**	0.082	1.466	0.538**	0.114	0.961
Had a role in family decisions?						
No (ref.)	-	-	-	-	-	-
Yes	-0.289	-0.748	0.170	-0.232*	-0.467	0.003
Received help from child(ren) for household work?						
No (ref.)	-	-	-	-	-	-
Yes	-0.255	-0.623	0.118	-0.144	-0.378	0.091
Received monetary support from child(ren)?						
No (ref.)	-	-	-	-	-	-
Yes	-0.155	-0.523	0.212	-0.041	-0.233	0.151
Provided monetary support to child(ren)?						
No (ref.)	-	-	-	-	-	-
Yes	0.363	-0.082	0.808	0.093	-0.195	0.384
Took care of (great)grandchild(ren) or other family members?						
No (ref.)	-	-	-	-	-	-
Yes	0.254*	-0.014	0.524	-0.077	-0.320	0.167
Participated in social organizations and community activities?						
No (ref.)	-	-	-	-	-	-
Yes	-0.116	-0.495	0.263	-0.157	-0.429	0.115
Had respect from community as an older person?						
No (ref.)	-	-	-	-	-	-
Yes	-0.282*	-0.613	0.049	-0.166	-0.494	0.162

Notes: \*, \*\*, \*\*\* denote statistically significant Beta coefficient at the 10, 5 and 1 percent significance level respectively; (ref.) denotes the reference groups.

Source: Own calculations, using VNAS 2011

For demographic factors, we obtained various results. With regard to age, the results showed that this did not have a significant impact on depression for those living in rural areas, but it did have a significant influence on those living in urban areas. This finding was quite similar to those from Bassem et al. (2005) and Le et al. (2017). In terms of sex, being male resulted in a lower probability of being depressed than being female in urban areas, while there was no such difference in rural areas. These results are slightly different from those found in Barcelos-Ferreira et al. (2009) and Bojorquez-Chapela et al. (2009) where female older people were always more vulnerable to depression than their male counterparts. As Giang and Phi (2016) discussed, age and/or sex alone might not be significant factors to the extent that they are closely linked to other factors (such as education and living arrangements) so as to significantly influence older people's vulnerable status (such as depression in this case).

Marital status did not show an influence on the depression of urban older people, but it had a significant influence on that of rural older people. Being currently married was found to help reduce the probability of being depressed for rural older people by about 25% compared to being currently not married. These findings for rural older people are quite similar to those found in Sicotte et al. (2008) and Bojorquez-Chapela et al. (2009).

The results in Table 3 indicate that educational level and working status did not have any statistically significant impact on depression for older people, regardless of whether they lived in urban or rural areas. The findings are the same as those found in Le et al. (2017).

For both areas, having difficulties with ADLs was also found not to be significantly associated with older people's depression. This was in contrast to the findings for older people in other countries, such as Mexico in Bojorquez-Chapela et al. (2009). One possible explanation for this is that the majority of older people were able to get help from their children and other family members and the community when needed with difficulties with ADLs (VWU, 2012).

Functional limitations were found statistically significant with rural older people, but not with urban older people. Facing at least a functional limitation could increase the probability of being depressed for rural older people by about 43% compared to those without any limitation.

Living alone was associated with a higher probability of being depressed for rural older people, but it was not for urban older people. Differences in living conditions, especially differences in accessing and being able to afford social services, may be a key explanatory factor here. These findings are quite similar to those for Malaysia (Sidik, Zulkefli & Shah, 2003); Spain (Zungzunegui, Béland & Otero, 2009), Thailand (Jittawisuthikul et al., 2011), and Brazil (Borges et al., 2013).

In both areas, experiencing financial difficulties and domestic violence was found to increase depression in older people. This was quite a common finding for various countries with different socio-economic settings (Bassem et al., (2005); Maulik & Dasgupta (2012); and Borges et al., (2013)).

Particularly for rural older people, having a role in family decisions was also found to help to reduce the probability of depression. Since rural older people usually live in large-size families with multiple generations and lower incomes, they usually face more pressures on financial needs and generational relationships. Peltzer and Phaswana-Mafuya (2013) have provided quite similar results when discussing the impact of quality of life, in which income security and family relationships are the major factors.

The mutual support between older people and their children in both areas did not have any impact on older people's depression. This finding was quite different from previous studies in other countries—for instance, Zungzunegui et al. (2009) showed that receiving their children's support was associated with low depressive symptomatology. One possible explanation for this finding in Vietnam was that receiving and giving support between older people and their children—either in monetary or non-monetary terms—acted as a proxy for familial duties and risk-sharing activities in both urban and rural areas.

Having caring (great) grandchildren or other family members was not associated with depression in the rural elderly, but it was significantly and negatively associated with depression in urban older people. Higher costs of living and opportunities for the urban elderly than the rural elderly could be a reason for such a difference.

Similar differences were observed concerning older people's satisfaction with the respect they received from the community; urban older people who were not satisfied with the respect the community showed them had a higher probability of being depressed than those who were satisfied. This was not the case with regard to rural older people, where this variable did not have any impact. Stronger social networks, and thus social support, in rural areas could be an explanatory factor here. Sicotte et al. (2008) provided a similar finding.

Satisfaction with current financial status was also found to help to reduce older people's depression in both urban and rural areas. This means that providing income security, among other factors, should be an important policy to help older people feel less depressed in their daily lives. Giang, Mai and Nguyen (2016) showed that, among older people faced with worsening financial situations, older people who lacked life satisfaction were those with more

financial constraints. Wilkinson (2016) proved that financial strain was a strong and robust predictor of worsening mental health among older people in the US between 2006 and 2010.

## Concluding Remarks

The above findings and analyses have shown that a number of factors were associated with depression in the elderly population of Vietnam, and they varied among urban and rural groups. In general, we found that older people in both areas were more likely to be depressed if they faced insufficient finance for daily living and experienced domestic violence. In contrast, education, working status, difficulties with ADLs, and the status of mutual support between older people and their children were not found to be significant contributing factors. For these, income protection and family relation protection were likely important measures for reducing depression. In addition, a small number of studies have indicated that depression in the elderly has been neglected in Vietnam, and thus there should be more evidence-based studies using national survey data which could suggest appropriate policy measures for the government to pursue.

Although the paper has presented several factors which are possibly associated with depression in older people, there are some obvious limitations to the work. First, depression is simply defined and measured here, compared to more standardized measurements in other existing studies for the elderly in other countries. This is because the VNAS could not provide sufficient information to construct at least one such standardized definition and measurement. Second, cross-sectional data also limited us in exploring related issues, including health-risk behaviors, historical illness and disability, and macroeconomic booms and shocks. We are certain that with these factors considered, the paper would have provided a more comprehensive and meaningful analyses on depression of the Vietnamese older people—a persistently neglected, though important, mental health issue.

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